

System for information storage and/or reproduction, cassette for information storage, apparatus for information storage and/or reproduction on/from a tape in a cassette.

The invention relates to a system for storing and/or reproducing information, comprising a cassette and an apparatus, which cassette has a housing which accommodates a tape and a tape guide, which apparatus comprises an optical head for cooperation with the tape in order to store and/or reproduce information, and which tape
5 guide is situated near the location where the tape cooperates with the head and is in contact with the tape when the tape is taut in order to accurately position the tape.

Such a system is known from EP-B-0,206,392. The known system includes a cassette comprising two reel hubs and a rotatable tape guide. The tape is wound
10 onto the reel hubs and between the reel hubs it is guided by the tape guide. The tape guide is located near a window in the cassette and supports the tape at the location of the window at the tape edge which is remote from the window. The window makes the tape accessible for an optical head of an apparatus adapted to read or write on the tape. A disadvantage of the known system is that the position of the tape relative to the optical head of the apparatus is
15 not accurately defined.

It is an object of the invention to improve a system of the type defined in the opening paragraph in such a manner that the position of the tape at the location where it cooperates with the head is accurately defined relative to the head.

20 To this end the system in accordance with the invention is characterised in that the tape guide has a first stop, and the apparatus has a second stop which cooperates with the first stop to position the first stop. The advantage of these steps is that the position of the tape guide is no longer dictated by the housing of the cassette but that instead of this it is determined directly by the second stop of the apparatus. As a result, the cassette housing
25 may be manufactured without a high accuracy by means of customary technologies such as injection-moulding. The position of the tape relative to the head is only determined by the accuracy of the tape guide and the position of the second stop relative to the head in the apparatus. Moreover, owing to these steps the position of the tape relative to the head is no longer affected by deformations of the cassette housing.

The invention also relates to a cassette for the storage of information, which cassette comprises a housing with a window, which housing accommodates a tape and a tape guide; which tape is movable past the window, and which tape guide is situated near the window and is in contact with the tape when the tape is taut in order to accurately
5 position the tape.

A cassette for the system in accordance with the invention is characterised in that the tape guide has a first stop which is accessible from the exterior of the housing. This step enables the cassette to be positioned by engagement of this first stop with a second stop in the apparatus. This ensures in any case that the tape guide is positioned correctly.

10 The position of the housing is non-critical.

An embodiment of the cassette is characterised in that the tape guide is mounted in the housing so as to be movable. This step reduces the likelihood of the tape guide being lifted off the second stop in the apparatus by forces exerted on the housing. In addition, this embodiment makes it possible to provide separate stops for locating the
15 housing, which ensures a more stable position of the housing in the apparatus, which enables for example vibrations of the housing to be minimised.

An embodiment of the cassette is characterised in that the tape guide cooperates with a resilient element situated in the housing, which element bears against the tape guide and the housing. By means of this resilient element in the cassette the tape guide
20 can be pressed with its first stop onto the second stop of the apparatus. As a result, the apparatus need not be provided with means which assure contact between the stops, so that the construction of the apparatus is simplified. In addition, this resilient element enables the tape guide to be urged into a fixed position in the cassette when the cassette is not in the apparatus. This precludes rattling of the tape guide in the cassette and makes it possible to
25 seal the opening in the housing at the location of the first stop so as to prevent the ingress of dust and dirt into the cassette.

An embodiment of the cassette is characterised in that the cassette comprises a number of reel hubs which are drivable at a first side of the housing, and the first stop is accessible from the first side. As a result of these steps insertion of the cassette
30 into the apparatus can be simplified by moving the cassette in a direction perpendicular to the first side. With this embodiment the loading mechanism of the apparatus can be of simple and, consequently, cheap construction.

An embodiment of the cassette is characterised in that the window is provided at a second side of the housing, and the first stop is accessible from the second

side. This embodiment has the advantage that the second stop of the apparatus can be arranged close to the head, which makes it is simple to realise an accurate position of the head and the second stop relative to one another. Another advantage is that the first stop can be arranged in the same side of the tape guide as a tape guide surface which positions the tape at the location of cooperation with the head. Thus, an accurate position of the guide surface relative to the first stop on the tape guide can be realised simply, for example by forming both elements in the same half of a mould.

An embodiment of the cassette is characterised in that the tape guide is in contact with the side of the tape which is remote from the window. This embodiment has the advantage that the tape guide does not come into contact with an optical surface of the tape. As a result, the side of the tape which comes into contact with the tape guide can be provided with an anti-friction layer which need not comply with any optical requirements. This anti-friction layer can thus be optimised for minimal friction with the tape guide and minimal wear. Another advantage of this embodiment is that the first stop and the guide surface can be formed by a single surface. This enables a correct position of the first stop and the guide surface relative to one another to be obtained by simple means, for example by polishing such a surface.

The invention also relates to an apparatus for storing and/or reproducing information on/from a tape in a cassette, which apparatus comprises an optical head for cooperation with the tape in order to store and/or reproduce information.

An apparatus for the system in accordance with the invention is characterised in that near the head the apparatus has a second stop for positioning a first stop of the cassette.

An embodiment of the apparatus is characterised in that the apparatus comprises an actuator which is adapted to move the second stop relative to the head. This embodiment has the advantage that deviations of the position of the tape guide from the ideal position can be corrected by means of the actuator. These deviations can be measured, for example, by means of the head itself. This enables tolerances in the dimensions of the tape guide, which arise for example in the production of this tape guide, to be corrected separately for each tape guide. This correction possibility also allows less stringent requirements to be imposed on the position of the second stop relative to the head, which makes the production of the apparatus cheaper.

Figure 1 is a sectional plan view of a cassette for the system in accordance with the invention,

Figure 2 is a sectional side view of a cassette and an apparatus for the system in accordance with the invention in a condition in which they cooperate,

5 Figure 3 is a plan view of a detail of the cooperation between the cassette and the apparatus in an embodiment of the system in accordance with the invention, and

Figure 4 is a side view of the detail shown in Figure 3.

It is to be noted that the embodiments are shown diagrammatically and the Figures are shown to an arbitrary scale, which is not always the same.

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Figure 1 is a sectional plan view of a cassette 10 for the system in accordance with the invention. The cassette has a housing 11 provided with a window 15 in a first side 14. The housing 11 accommodates two reel hubs 18 and 19 and a tape guide 30. A tape 13 is wound to form a spool 16 on the reel hub 19, extends past the tape guide 30 and is attached to the reel hub 18. The tape 13 can be moved past the window 15 by driving the reel hub 18.

Figure 2 is a sectional side view of the system in accordance with the invention. The system includes the cassette 10 and an apparatus 20. The apparatus 20 has an optical head 21 adapted to cooperate with the tape 13 for the storage and/or reproduction of information. The tape guide 30 in the cassette 10 is situated near the location where the tape 13 cooperates with the head 21. A guide surface 32 of the tape guide 30 is in contact with the tape 13 when this tape 13 is taut, in order to ensure an accurate positioning of the tape. When the tape 13 is moved past the tape guide 30 a very thin air cushion can be formed between the tape guide and the tape and contact takes place via this air cushion.

25 By means of the optical head 21 a light beam 22 is focused to form a light spot 40 on the tape 13 in order to write or read information on/from the tape 13. The light spot 40 performs a scanning movement in a direction 43 perpendicular to the longitudinal direction of the tape 13, the light spot always being focused in a focus line 41 perpendicular to the optical axis 45 of the head 21. This scanning movement is so fast that the distance between the head 21 and the tape 13 cannot be adapted within the time interval of one scanning movement. Yet, in order keep the light spot 40 in focus on the tape 13 during a scanning movement care must be taken that the focus line 41 extends parallel to the tape 13. In order to achieve this the tape guide 30 should be positioned accurately by adjusting at least the angle α between the optical axis 45 of the optical head 21 and the guide surface 32 to a

predetermined value. For this purpose the tape guide 30 has a first stop 33 and the apparatus has a second stop 23 for positioning the first stop 33. To allow this positioning the first stop 33 is accessible from the exterior of the housing 11 of the cassette 10.

5 In order to ensure proper contact between the first stop 33 and the second stop 23 the tape guide 30 is mounted in the housing 11 so as to be movable. This allows forces to be exerted on the housing 11 without the tape guide 30 being moved relative to the stop 23. The movable arrangement allows an exact positioning of the tape guide 30 while the housing 11 of the cassette 10 is pressed onto supporting points 24 of the apparatus. This provides a stable positioning of the housing 11.

10 Since the tape guide 30 forms part of the cassette 10 the advantage is obtained that no parts of the apparatus 20 come into mechanical contact with the tape 13. As a result, loading and unloading of the cassette 20 proceeds more rapidly and the likelihood of damage to the tape 13 is reduced, so that a more robust system is obtained. Moreover, only one tape guide is required in the entire system, which minimises frictional forces on the tape
15 13, even in the case of very rapid transport of the tape. Moreover, during fast transport the tape 13 remains positioned by the tape guide 30, so that in a special read mode the position on the tape 13 can be determined, thereby enabling a piece of information on the tape 13 to be located very rapidly.

The tape guide 30 cooperates with a resilient element 17 situated in the
20 housing 11, which element bears against the tape guide and the housing. In the present case this resilient element is a blade spring 17, which urges the first stop 33 against the second stop 23. This ensures proper contact between the first stop 33 and the second stop 23 without any means being provided for this in the apparatus 20. Moreover, the resilient element 17 presses a flange 35 of the tape guide 30 against a wall of the housing 11 when the cassette 10
25 is removed from the apparatus 20. This precludes rattling of the tape guide 30 in the cassette 10 when the cassette is outside the apparatus 20. Moreover, it is thus simply possible to seal the opening in the housing 11 at the location of the first stop 33. This sealing prevents the ingress of dust and dirt into the cassette 10.

At a first side 12 of the housing 11 the reel hub 18 is accessible for
30 engagement with a spindle 27 of the apparatus 20. This spindle 27 can drive the reel hub 18. In addition, the reel hub 18 may have a supporting ring 18a which is supported on a disc 29 of the apparatus 20 to position the reel hub. The first stop 33 is also accessible from the first side 12. As a result, the cassette 10 can be loaded simply into the apparatus 20 by moving it perpendicularly to the first side 12. During loading the reel hub 18 engages with the spindle

27 and is positioned by the disc 29, the stop 23 being positioned by the first stop 33. Since the cooperation between the head 21 and the tape 13 is without mechanical contact neither the head 21 nor the tape 13 need be moved when the cassette 10 is loaded. As a result, the loading mechanism can be of simple and, consequently, cheap construction.

5 Figure 3 is a sectional plan view illustrating the cooperation between the first stop 33 and the second stop 23 in an embodiment of the system in accordance with the invention. In the present embodiment the window 15 is situated at a second side 14 of the housing 11. The first stop 33 of the tape guide 30 is accessible from this second side 14, in the present case *via* the window 15. In this embodiment the tape guide 30 is constructed as a
10 non-rotatable element which has a guide surface 32 at its side facing the window in order to guide the tape 13. The tape guide 30 has flanges 35 at both edges of the tape 13. These flanges 35 also form the first stop 33. The cassette 10 further comprises springs 17, which urge the tape guide 30 towards the window 15. The second stop 23 has arms 23a, which are placed against the first stop 33 in opposition to the pressure of the springs 17 during
15 cooperation of the head 21 of the apparatus 20 with the cassette 10. By means of the second stop 23 the first stop 33 is accurately positioned relative to the head 21. Since the second stop 23 is situated close to the head 21 it is simple to achieve an accurate positioning of the second stop 23 relative to the head 21. At the location of cooperation with the head 21 the tape 13 can be positioned accurately in a simple manner because the first stop 33 and the
20 guide surface 32 are situated at the same side of the tape guide 30.

 In the present embodiment the tape guide 30 is in contact with the side of the tape 13 which is remote from the window 15. As a result, there is no mechanical contact between an optical surface of the tape 13 and the tape guide 30. Consequently, the side of the tape 13 which is remote from the window 15 can be provided with an anti-friction layer
25 which need not comply with any optical requirements. This anti-friction layer can thus be optimised for minimal friction with the tape guide 30 and minimal wear. A low friction is important in order to allow high-speed movement of the tape 13 past the tape guide 30. This has the advantage that the tape 13 can be moved rapidly from the reel hub 19 to the reel hub 18 and *vice versa*, thereby enabling a short access time to a given piece of information on the
30 tape 13 to be obtained.

 Figure 4 is a sectional view of the same detail as shown in Figure 3, taken at the location of one of the arms 23a (see Fig. 3). This sectional view clearly shows how the second stop 23 engages with the first stop 33, in the present case formed by the flanges 35, without coming into contact with the tape 13.

Figure 1 also shows that the apparatus 20 has an actuator 25 adapted to move the second stop 23. This actuator can be, for example, a piezoelectric actuator. This actuator 25 enables the position of the tape guide 30 relative to the head 21 to be controlled. This control provides a correction for dimensional deviations in the tape guide 30 or the
5 apparatus 20.

In addition to the embodiments described herein many other embodiments are possible within the scope of the invention. For example, the positioning of the tape guide 30 may be extended to several degrees of freedom. By means of the tape guide 30 it is also possible to position the tape 13 dynamically in order to keep the light spot 40 always in focus
10 on the tape 13 while the tape is being read or inscribed.

CLAIMS:

1. A system for storing and/or reproducing information, comprising a cassette (10) and an apparatus (20),
 - which cassette has a housing (11) which accommodates a tape (13) and a tape guide (30),
 - 5 - which apparatus comprises an optical head (21) for cooperation with the tape in order to store and/or reproduce information, and
 - which tape guide is situated near the location where the tape cooperates with the head and is in contact with the tape when the tape is taut in order to accurately position the tape,
- 10 characterised in that
 - the tape guide (30) has a first stop (33), and
 - the apparatus has a second stop (23) which cooperates with the first stop to position the first stop.
2. A cassette (10) for the storage of information,
- 15 - which cassette comprises a housing (11) with a window (15), which housing accommodates a tape (13) and a tape guide (30),
 - which tape is movable past the window, and
 - which tape guide is situated near the window and is in contact with the tape when the tape is taut in order to accurately position the tape,
- 20 characterised in that
 - the tape guide (30) has a first stop (33) which is accessible from the exterior of the housing (11).
3. A cassette (10) as claimed in Claim 2, characterised in that the tape guide (30) is mounted in the housing (11) so as to be movable.
- 25 4. A cassette (10) as claimed in Claim 3, characterised in that the tape guide (30) cooperates with a resilient element (17) situated in the housing (11), which element bears against the tape guide and the housing.
5. A cassette as claimed in any one of the Claims 2 to 4, characterised in that



- the cassette (10) comprises a number of reel hubs (18, 19) which are drivable at a first side (12) of the housing (11), and
- the first stop (33) is accessible from the first side (12).

6. A cassette as claimed in any one of the Claims 2 to 5, characterised in

5 that

- the window (15) is provided at a second side (14) of the housing (11), and
- the first stop (33) is accessible from the second side.

7. A cassette as claimed in any one of the Claims 2 to 6, characterised in that the tape guide (30) is in contact with the side of the tape (13) which is remote from the
10 window (15).

8. An apparatus (20) for storing and/or reproducing information on/from a tape (13) in a cassette (10),

- which apparatus comprises an optical head (21) for cooperation with the tape (13) in order to store and/or reproduce information,

15 characterised in that

- near the head (21) the apparatus (20) has a second stop (23) for positioning a first stop (33) of the cassette (10).

9. An apparatus as claimed in Claim 8, characterised in that the apparatus comprises an actuator (25) which is adapted to move the second stop (23) relative to the head
20 (21).